Superfund Proposed Plan

U.S. Environmental Protection Agency, Region 2

Crown Vantage Landfill Superfund Site

Alexandria Township, Hunterdon County, New Jersey

June 2011

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan describes remedial alternatives considered for the Crown Vantage Landfill Superfund site (Site) and identifies the preferred remedial alternative, with the rationale for this preference. The Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA), as lead agency, with support from the New Jersey Department of Environmental Protection (NJDEP).

The EPA's Preferred Alternative includes containment, as provided by a forested cover and stabilization wall, with institutional controls. Previous cleanup actions under EPA's direction have been implemented at the Site to remove all known drums, drum carcasses and drum remnants from the landfill. EPA also oversaw construction of the engineered wall designed to stabilize the landfill and prevent landfill materials from eroding into the Delaware River. The Preferred Alternative incorporates and builds upon these earlier cleanup actions to complete the response action at the Site.

This Proposed Plan includes a summary of all remedial alternatives evaluated for the Site. EPA, in consultation with NJDEP, will select the final remedy after reviewing and considering all information submitted during a 30-day public comment period. EPA, in consultation with NJDEP, may modify the preferred alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on the alternatives presented in this document.

EPA is issuing the Proposed Plan as part of its public participation responsibilities to inform the public of EPA and NJDEP's preferred remedy and to solicit public comments pertaining to the remedial alternatives under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA or Superfund). The alternatives summarized in the Proposed Plan are described in more detail in the *Feasibility Study Report, Crown Vantage Landfill Site, Alexandria Township, New Jersey*, International Paper, Georgia-Pacific Consumer Products LP, and TRC, November 2010 (2010 FS), which should be consulted for a more detailed description of the alternatives.

COMMUNITY ROLE IN SELECTION PROCESS

EPA and NJDEP rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. The 2010 FS report and this Proposed Plan have been made available to the public for a public comment period which begins on July 1 and concludes on July 30, 2011.

MARK YOUR CALENDAR

July 1, 2011 – July 30, 2011: Public comment period related to this Proposed Plan.

July 12, 2011 at 7:00 P.M.: Public meeting at the Milford Firehouse, 21 Water Street, Milford, New Jersey.

For more information, see the Administrative Record file (which includes the Proposed Plan and supporting documents), available at the following locations:

Milford Public Library
40 Frenchtown Road
Milford, NJ 08848
Telephone: (908) 995-4072
Hours vary – check with library

USEPA-Region II
Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
(212) 637-4308 Monday-Friday, 9:00 a.m. - 5:00 p.m.

Written comments on this Proposed Plan should be addressed to:

Alison Hess
Remedial Project Manager
Special Projects Branch
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, New York 10007-1866
Telephone: (212) 637-3959, Fax: (212) 637-4439
Email address: Hess.Alison@epamail.epa.gov

or

Pat Seppi
Community Involvement Coordinator
290 Broadway, 26th Floor
New York, New York 10007-1866
Telephone: 212-637-3679
Email address: Seppi.Pat@epa.gov

EPA's website for the Crown Vantage Landfill Site:
http://www.epa.gov/region2/superfund/npl/crownvantage/

The link to EPA's Proposed Plan is at:
http://www.epa.gov/region02/superfund/npl/crownvantage/ProposedPlan

A public meeting will be held during the public comment period at the Milford Firehouse, 21 Water Street, Milford, New Jersey on July 12, 2011 at 7:00 P.M. to explain the Proposed Plan and to receive public comments. Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD). The address for public comments is provided on the front page of this Proposed Plan.

SITE BACKGROUND

Site Description

The Site is an inactive former landfill located within Alexandria Township in Hunterdon County, New Jersey. The landfill occupies an area of approximately 10 acres, with approximately 1,500 feet of frontage on the eastern bank of the Delaware River. A mix of young and mature hardwood trees, shrubs and grasses covers the Site. Access to the landfill area is restricted by locked chain-link fencing.

The Site is bounded to the east by the Delaware and Raritan Canal footpath and a farm field. County Route 619 borders the field to the east, approximately 1,000 feet from the Site itself. The landfill property is bounded to the south by the Delaware Raritan Canal State Park and to the north by the former Curtis Specialty Papers mill property. To the west of the landfill, across the Delaware River, lies Bucks County, Pennsylvania. The segment of the Delaware River adjacent to the Site is a federally-designated recreational river.

With the exception of the former Curtis Specialty Papers mill, located approximately ½ mile to the north of the landfill, the land use in the area is mixed agricultural, residential and recreational. The closest residences are just under ½-mile north of the Site. The Site is located within the 100-year floodplain of the Delaware River.

Ground water is the primary source of drinking water in the area. The Milford Water Department serves the adjacent Borough of Milford, with two wells located approximately 1 to 1½ miles to the northwest of the Site. All private and public potable wells identified in this study are hydraulically upgradient or sidegradient of the Site.

Site History

The landfill was reportedly utilized by the nearby Curtis Specialty Papers mill, as well as by other nearby Riegel Paper Company facilities for the disposal of waste beginning in the late 1930s through the early 1970s. The landfill may also have accepted flood-damaged items from the local community following record flooding of the Delaware River in 1955. Other types of wastes disposed of at the landfill include fly ash, cinders, and bottom ash; paper mill and coating-related wastes, including foil-backed paper, off-specification paper, 55-gallon drums containing press room wastes, and paper fiber sludge from wastewater treatment plant operations; steel and fiber barrels and pallets; and construction and demolition debris. A review of historical aerial photos indicated that shallow trenches in the surface of the landfill may have been used for the burial of drummed wastes in the early 1970s.

The Site has been characterized through numerous investigations that started in 1991 and continued to the recent Remedial Investigation (RI), which was conducted in 2008 and 2009. A Preliminary Site Investigation (PSI), including an aerial photograph analysis, geophysical survey of the landfill area, soil gas sampling, ground water sampling and a wetlands assessment, was conducted in 1991. The PSI was followed by the removal of drums (empty, full, and partially full) and paper products from the surface of the landfill. In 1994, monitoring wells were installed and the ground water quality was characterized.

From 2001 through 2003, the NJDEP fenced the site, removed additional surface debris, including drums, and collected surface soil samples. The EPA conducted additional sampling of surface water, sediment, surface soil and fly ash, and ground water in 2003 and 2004. Additional wastes were removed from the surface and riprap was placed in flood-impacted areas.

The Site was formally named as a Superfund site in 2005. In May 2005, Fort James Operating Company, a subsidiary of Georgia-Pacific, entered into an Administrative Agreement and Order on Consent (AOC) for a Removal Action with EPA. Under the 2005 AOC, additional surficial drums were removed, additional fencing was provided, and an engineered wall (see photo) was constructed to stabilize the landfill's western face. In total, over 700 surficial drums, drum remnants and drum carcasses were removed from the surface of the Site during investigations conducted between 1991 and 2007.

In September 2007, Georgia-Pacific Consumer Products, LP (GPCP) signed an AOC for a Remedial Investigation/Feasibility Study (RI/FS) with EPA and in December 2007, International Paper Company (IP) was issued a Unilateral Administrative Order by EPA for a Removal Action and RI/FS. In 2008, the RI was initiated.

Site Geology/Hydrogeology

Geology in the immediate vicinity of the Site consists of a thin layer of glacial drift and river alluvium overlying red to reddish brown Brunswick Shales. The drift and alluvium at the Site generally consist of brown silty sand/sandy silt underlain by a red-brown sandy gravel layer. The drift and alluvium layer ranges in thickness from approximately 19 to 27 feet, although it is thinner immediately adjacent to the river. Based on local outcrops of the underlying red siltstone, shale and mudrocks, the bedrock generally dips to the north/northwest at 5 to 12 degrees and has nearly vertical fractures.

While the surficial alluvium is permeable, the alluvial deposits are small in extent and scattered, and therefore are not a major source of domestic water supply. Ground water that is found within the joints, fractures and bedding planes of the Brunswick Shales is more commonly used as a source of drinking water. Ground water flow directions in the overburden are generally from the river valley sides towards the Delaware River (i.e., topographic highs to topographic lows). The upper bedrock aquifer also discharges into the river. The overburden ground water quality was characterized during previous investigations conducted in 1991, 1994 and 2003 and through pore water sampling conducted in 2009 as part of the RI, with no impacts to ground water quality detected that were attributable to the landfill. The depth to ground water is approximately 15 to 25 feet.

REMEDIAL INVESTIGATION SUMMARY

The RI included the collection of surface soil, sediment, surface water and pore water (representing ground water discharging to the Delaware River) samples. Test pitting was also conducted in areas of suspected trenching and drum disposal to determine the nature of the buried wastes.

A total of 26 test pits were completed across three areas of suspected drum disposal. Drum carcasses, drum remnants and/or partially intact drums were identified and removed from test pits located in each of the three areas. Other wastes observed in the test pits included foil-backed paper, fly ash, household refuse and construction materials. The analysis of waste characterization samples collected from materials contained within the drums or drum carcasses indicated high concentrations of volatile organic compounds (VOCs) and, in some liquids, polychlorinated biphenyls (PCBs). Following the completion of initial test pitting operations, EPA authorized the expansion of the test pitting program into a larger drum removal effort. In each of the three original test pit areas, those test pits where additional drums and carcasses were observed beyond the extent of the original test pits were expanded to remove remaining drums. Through the combined test pitting and expanded drum removal operations, over 1,750 drums, drum carcasses and drum remnants were removed from below the surface of the landfill. No drums were observed at depths of greater than approximately 10 feet. Wastes generated as a result of the expanded test pitting/drum removal effort were often found to be hazardous due to ignitability, or were characteristically hazardous, primarily due to benzene. All excavated wastes were shipped off the Site with the majority of the wastes incinerated at permitted waste management facilities. Test pit excavation areas were backfilled with clean fill, covered with six inches of topsoil, seeded, and mulched.

A total of 35 surface soil samples were collected from areas representative of the original landfill surface prior to the initiation of removal actions and test pitting activities. The surface soil samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), pesticides, PCBs, and inorganics. The analytical results were compared to New Jersey Non-Residential Direct Contact Soil Remediation Standards (NRDCSRS) and EPA Regional Screening Levels (RSLs). In general, individual surface soil samples exhibited the presence of polynuclear aromatic hydrocarbons (PAHs) and vanadium at levels exceeding NRDCSRS and EPA RSLs, although when average concentrations are considered, only benzo(a)pyrene was detected above NRDCSRS. The presence of elevated PAH levels appeared to coincide with the presence of surficial fly ash at many of the sample locations. PCBs and arsenic were detected at levels exceeding EPA RSLs only. Overall, the RI surface soil results were consistent with the results of previous surface soil investigations.

Sediment samples were collected for SVOC, pesticide, PCB and metals analyses at six locations in the Delaware River adjacent to, upstream of, and downstream of the Site. The sample locations mirrored locations sampled by EPA in 2003. PAHs, 4,4'-DDT and inorganics were detected at levels exceeding New Jersey Ecological Screening Criteria (ESCs). Several inorganics were detected at levels exceeding the ESCs in the upstream sample, indicating that their presence may not be associated with the Site. The analytes detected in the RI samples were comparable to those detected in EPA's 2003 samples, with concentrations generally lower than the 2003 concentrations, with a few exceptions. The 2003 upstream sediment samples also exhibited PAHs, 4,4'-DDT and inorganics at levels exceeding ESCs.

Surface water samples were collected at five locations along the edge of the Delaware River, adjacent to the Site, for VOC and metals analysis. The surface water samples exhibited the presence of total arsenic above the New Jersey Surface Water Quality Standards (SWQS) based on human health (fish and water ingestion), even though the river is not used as a source of drinking water in the immediate vicinity of the Site. The maximum concentration of arsenic detected was 0.388 micrograms per liter (µg/L), which is well below the Delaware River Basin Commission's Water Quality Criterion (WQC) of 50

µg/L for the adjacent stretch of the river. The dissolved concentrations of arsenic did not exceed the SWQS based on aquatic environmental exposures. In addition, regional concentrations for arsenic in New Jersey stream waters range from 1 to 4 µg/L with detected arsenic levels measured in the Delaware River upstream of the site ranging from 1 µg/L to 1.7 µg/L. Therefore, the presence of arsenic is not expected to be related to the Site.

Pore water samples were collected at five locations along the edge of the Delaware River, adjacent to the Site, for VOC and metals analysis. Access issues prevented the installation of monitoring wells along the toe of the landfill's slope as part of the RI; therefore, pore water samples were collected to characterize ground water discharging into the river. Field measurements confirmed that the pore water was representative of discharging ground water before the samples were collected. The pore water results were evaluated relative to state and federal Maximum Contaminant Levels (MCLs) and state Ground Water Quality Standards (GWQS) and, because the pore water samples collected during the RI represent pore water that is discharged into the Delaware River, the pore water results were also compared to the New Jersey SWQS. VOCs were not detected in any of the pore water samples. Inorganics were detected in the pore water samples, including arsenic, which was detected in a single sample at a level exceeding the MCL. Arsenic was also detected in two samples at levels exceeding human-health-based SWQS. In previous site investigations, arsenic was also detected in monitoring wells located upgradient of the landfill at levels exceeding MCLs, indicating that its presence is not related to the Site. Several other inorganics (aluminum, manganese and iron) were detected at levels that exceed GWQS. No inorganic constituents were detected at levels that exceeded SWQS based on aquatic exposures.

SCOPE AND ROLE OF ACTION

Immediate actions, including the construction of the stabilization wall and the removal of drums from the Site during the RI, were taken to address situations that presented an imminent threat to human health and the environment. The primary objective of the actions described in this Proposed Plan is to address potential current and future health and environmental impacts associated with the remaining landfilled materials at the Site.

RISK SUMMARY

The purpose of the risk assessment is to identify potential cancer risks and non-cancer health hazards at the Site assuming that no further remedial action is taken. A baseline human health risk assessment (BHHRA) was performed to evaluate current and future cancer risks and non-cancer health hazards based on the results of the RI.

As described in the "What Is Risk and How Is It Calculated?" box, the cancer risk is compared to EPA's acceptable cancer risk range of 10^{-6} to 10^{-4}. The lower end of EPA's acceptable risk range, 10^{-6}, is also referred to as the "point of departure." Cancer risks that exceed 10^{-4} indicate that a remedial action should be taken. Generally, no action is taken when the cancer risk is lower than 10^{-6}. For non-carcinogenic effects, a health Hazard Index (HI) greater than 1 indicates a potential of non-carcinogenic health effects.

A screening-level ecological risk assessment (SLERA) and baseline ecological risk assessment (BERA) were also conducted to assess the risk posed to ecological receptors due to site-related contamination.

Baseline Human Health Risk Assessment

As part of the RI, a BHHRA was conducted to estimate the risks and hazards associated with the current and future effects of contaminants on human health. A BHHRA is an analysis of the potential adverse human health effects caused by hazardous substance exposure in the absence of any actions to control or mitigate exposure under current and future land uses.

A four-step human health risk assessment process was used for assessing site-related cancer risks and non-cancer health hazards. The four-step process is comprised of: Hazard Identification of Chemicals of Potential Concern (COPCs), Exposure Assessment, Toxicity Assessment, and Risk Characterization (see "What Is Risk and How Is It Calculated" box on next page).

The BHHRA evaluated potential risks to the following under current/future land use scenarios:

- Hikers exposed to surface soils;
- Anglers exposed through ingestion of fish;
- Hunters exposed through ingestion of wildlife tissue; and
- Swimmers exposed to river sediments.

Currently, fencing limits access to the Site by hikers and hunters; the BHHRA does not consider such engineering controls in the definition of potential exposure scenarios, however.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current and future land uses. A four-step process is utilized to assess site-related human health risks for reasonable maximum exposure (RME) scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at a site in various media (*e.g.,* soil, surface water, and sediment) are identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a reasonable maximum exposure scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment*:* In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a one-in-ten-thousand excess cancer risk; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk) with 10^{-6} being the point of departure. For non-cancer health effects, a hazard index (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a threshold level (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

For each exposure scenario, exposures of adults, adolescents and young children were evaluated. As the Site is a landfill site located within a floodplain, future residential or industrial use of the Site was not considered likely or probable and therefore was not evaluated. Surface water exposures were considered; however, all surface water detections were below applicable screening levels or regional background levels, so cancer risks and non-cancer health hazards due to exposure to surface water were not quantitatively evaluated.

Exposure point concentrations were estimated using either the maximum detected concentration of a contaminant or the 95%, 97.5% or 99% upper-confidence limit (UCL) of the average concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably anticipated to occur at the Site. The RME is intended to represent a conservative exposure scenario that is still within the range of possible exposures. A complete evaluation of all exposure scenarios can be found in the BHHRA.

Summary of Risks to Hikers – The carcinogenic risks to current/future adult, adolescent and young child hikers exposed to surface soils ($2x10^{-6}$, $1x10^{-5}$, and $2x10^{-5}$, respectively) fall within EPA's target risk range of 10^{-6} to 10^{-4}. The non-carcinogenic hazard indices (HIs) for adult, adolescent and young child hikers are all less than the EPA reference level of 1, indicating that no action is necessary to protect human health from non-carcinogenic hazards.

Summary of Risks to Anglers – The carcinogenic risks to current/future adult, adolescent and young child anglers exposed to Site contaminants through the consumption of fish tissue ($2x10^{-6}$, $2x10^{-6}$, and $3x10^{-6}$, respectively) fall within EPA's target risk range of 10^{-6} to 10^{-4}. The non-carcinogenic HIs for adult, adolescent and young child anglers are all less than the EPA reference level of 1**,** indicating that no action is necessary to protect human health from non-carcinogenic hazards.

Summary of Risks to Hunters – The carcinogenic risks to current/future adult, adolescent and young child hunters exposed to Site contaminants through the consumption of wildlife (i.e., deer and rabbit) tissue ($1x10^{-8}$, $7x10^{-9}$, and $6x10^{-9}$, respectively) are all less than EPA's point of departure of 10^{-6}, indicating that no action is necessary to protect human health from carcinogenic hazards. The non-carcinogenic HIs for adult, adolescent and young child hunters are all less than the EPA reference level of 1, indicating that no action is necessary to protect human health from non-carcinogenic hazards.

Summary of Risks to Recreational Swimmers – The carcinogenic risks to current/future adult, adolescent and young child recreational swimmers exposed to Site contaminants through incidental ingestion and dermal contact with sediments on the banks of the Delaware River ($8x10^{-7}$, $1x10^{-6}$, and $6x10^{-6}$, respectively) either fall

within EPA's target risk range of 10^{-6} to 10^{-4} or are less than the point of departure of 10^{-6}. The non-carcinogenic HIs for adult, adolescent and young child swimmers are all less than the EPA reference level of 1, indicating that no action is necessary to protect human health from non-carcinogenic hazards.

Screening Level Ecological Risk Assessment

A SLERA was conducted to evaluate the potential for ecological effects from exposure to surface soil, surface water, and sediment. Concentrations of contaminants in these environmental media were compared to ecological screening values for both aquatic and terrestrial habitats as an indicator of the potential for adverse effects to ecological receptors. Analysis of exposures of terrestrial indicator species indicated that surface soil concentrations of high molecular weight (HMW) PAHs, the PCB Aroclor 1260, and lead warranted further evaluation to determine if there was a potential risk to birds and mammals. These contaminants were retained as surface soil contaminants of potential ecological concern (COPECs) and were included for further evaluation in the BERA. No COPECs were identified for the aquatic habitat (encompassing both the surface water and sediment) of the Delaware River near the Site, since the SLERA did not identify potential unacceptable risks to ecological receptors.

Baseline Ecological Risk Assessment

A field tissue residue study involving terrestrial invertebrates was conducted to further evaluate the potential for the identified COPECs (HMW PAHs, PCB Aroclor 1260, and lead) to adversely affect insectivorous and/or omnivorous birds and mammals. Eight soil samples were collected concurrently with invertebrate tissue samples (consisting mainly of earthworms) in order to develop site-specific invertebrate:soil bioaccumulation factors (BAFs). There was little correlation between concentrations of COPECs detected in terrestrial invertebrate samples and the corresponding surface soil samples (e.g., high soil concentrations did not necessarily result in high invertebrate sample concentrations). The site-specific BAFs were then used in the BERA to evaluate the exposure of birds and mammals to terrestrial invertebrate COPEC concentrations.

Exposure to the COPECs via the terrestrial food chain was evaluated by modeling exposures to indicator species selected for the Site (mourning dove, white-footed mouse, American robin, short-tailed shrew and American woodcock). The 95% UCLs of the mean surface soil COPEC concentrations at the Site were used to derive both plant (both foliage and fruits/seeds) and invertebrate COPEC concentrations and to calculate a daily dose estimate for each of the avian/mammalian receptors.

Quantitative risk estimates for the BERA were calculated using the hazard quotient (HQ) approach, which compares the exposure estimates with the selected toxicity reference values (TRVs) including the no observable adverse effect level (NOAEL) and lowest observable adverse effect level (LOAEL). Only chronic NOAEL and LOAEL values were used for the TRVs. The HQ is expressed as the ratio of the estimated exposure dose for the wildlife indicator species to the ecotoxicity benchmarks (i.e., chronic NOAEL and LOAEL TRVs). If the calculated HQ for a NOAEL TRV is less than one, then it is unlikely that that COPEC will result in an adverse effect on that indicator species. Conversely, a HQ greater than one indicates that that particular indicator species, which represents other similar receptors, may be at risk of an adverse effect from that COPEC.

The PCB Aroclor 1260 was not predicted to pose a potential risk to any of the five receptor species. The estimated exposure doses of HMW PAHs were at or below the NOAEL TRV for all receptors except mammalian insectivores (short-tailed shrew). However, the estimated HMW PAH exposure dose ingested by the shrew is less than the LOAEL TRV, indicating adverse effects to mammalian insectivores are also unlikely.

The estimated lead exposure doses ingested by the mourning dove (representing avian herbivores), American robin (representing avian omnivores) and woodcock/short-tailed shrew (representing avian/ mammalian insectivores) exceeded both chronic NOAEL and LOAEL TRVs, indicating possible impacts to the survival, growth or reproductive rate of these receptors. The avian omnivore, represented by the American robin, had the highest total hazard index. Therefore, the establishment of a lead preliminary remediation goal (PRG) for the robin would be considered protective of the remaining receptor species.

The PRG for lead was calculated based on the mean of lead concentrations derived using HQs of 1 for the selected NOAEL and LOAEL TRVs. The TRVs selected for the American robin were the lower 25^{th} percentile of the NOAEL and LOAEL values reported for avian studies regarding reproduction/growth endpoints. Based on the mean of the exposure dose concentrations derived using an HQ of 1 for these TRVs, the lead surface soil PRG was calculated to be 214.2 milligrams per kilogram (mg/kg). This PRG was exceeded in 3 of 35 surface soil samples collected at the Site during the RI. The estimated areal extent of lead in surface soil above the lead PRG was estimated to be less than 0.25 acre compared to a use area for the American robin of 1, meaning the entire 10 acre Site. Given the few exceedences of lead above background levels and the small areal extent involved (less than 2.5%), EPA determined that the Site is adequately protective of ecological receptors and that no remediation of lead in surface soils is warranted.

Summary

The cancer risks associated with exposures to Site-related contamination were below the upper-bound of the acceptable EPA risk range of 10^{-4}, although certain risk estimates did exceed the lower end of the acceptable risk range of 10^{-6} (i.e., the point of departure) (note that New Jersey uses an acceptable cancer risk of 1×10^{-6} for an individual contaminant). The contaminants that were the main drivers of risks that exceeded 10^{-6} were PAHs and/or arsenic. Arsenic was present in Site soils and sediments at concentrations that are less than the state background level of 19 mg/kg (which is documented in the New Jersey Remediation Standards, NJAC 7:26D, Appendix 1, footnote to Tables 1A and 1B). Therefore, site-specific cancer risks associated with arsenic can be considered to be less than those posed by background conditions in the State.

Another consideration was an evaluation of risks to recreational hikers associated with greater exposure frequencies, which NJDEP considers reflective of an "avid" hiker. Even under this more frequent exposure scenario of 104 days per year, cancer risks to adult, adolescent and young child "avid" hikers do not exceed the upper bound of the acceptable EPA risk range of 10^{-4}.

Based on the lack of cancer risks exceeding the upper bound of the acceptable EPA risk range, even under conservative exposure assumptions, the HHRA did not identify a need for remediation based on potential risks to human health.

Similarly, based on the limited presence of lead in surface soils at levels that exceed a site-specific calculated PRG based on ecological receptors, no need for remediation based on potential risks to ecological receptors was identified.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered guidance, and site-specific risk-based levels.

Because the BHHRA, SLERA and BERA for the Site did not identify the presence of unacceptable risks requiring remediation under current and anticipated Site use, the remedial action objectives were limited to the following:

- Prevent exposures to landfill materials.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be cost-effective, comply with ARARS, and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA §121(d), 42 U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains federal and state ARARs, unless a waiver can be justified pursuant to CERCLA §121(d)(4), 42 U.S.C. §9621(d)(4).

The guidelines and requirements established in the National Contingency Plan (NCP, 40 CFR 300.430) are also considered in the development of alternatives. EPA has recognized that at certain sites, the use of treatment technologies and the development of a wide range of remedial options may not be practicable.

WHAT IS A "PRINCIPAL THREAT"?

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

At the Site, hot spot removals were conducted during historical investigations and during the RI, based on the following:

- surficial drums were removed during historical investigations;
- the subsequent RI investigated areas where existing evidence indicated the potential presence and approximate locations where drums had been disposed;
- the drums removed from the Site exhibited characteristics of principal threat wastes;
- the buried drums identified during the RI were present in discrete and accessible areas of the landfill; and
- the hot spot areas were large enough that their remediation (i.e., removal) has reduced the threat posed by the overall site, but small enough that they could be reasonably removed.

Therefore, the remedial alternatives developed for the Site focused on alternatives that address the low-level threats posed by the remaining landfill materials, given that the principal threats posed by the Site have already been addressed by the drum removal activities. Containment using an engineered cap was considered as a containment option, but was eliminated from further consideration in the FS report during the initial screening of technologies based on overall implementability, effectiveness and cost because the BHHRA, SLERA and BERA indicate that surface conditions at the Site do not pose unacceptable human health or ecological risks requiring remediation, because the existing stabilization wall provides protection against erosion along the river's edge, and because containment is not necessary to protect ground water quality.

A detailed discussion of the development of remedial alternatives and descriptions of the alternatives can be found in the 2010 FS report. The remedial alternatives identified for the Site are:

Alternative 1: No Further Action

Capital Cost:	$0
Annual Operation and Maintenance (O&M) Cost:	$20,000
Present-Worth Cost:	$52,000
Construction Time:	0 months

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no further action alternative does not include any physical remedial measures (beyond those remedial and removal actions already completed) that address any site-related media.

Because this alternative would result in contaminants remaining on-site above levels that would allow for unlimited use and unrestricted exposure, CERCLA requires that the Site be reviewed every five years. The only costs included in this alternative are those associated with the performance of five-year reviews.

Alternative 2: Forested Cover and Stabilization Wall with Institutional Controls

Capital Cost:	$44,000
Annual O&M Cost:	$55,500
Present-Worth Cost:	$219,000
Construction Time (Establishment of Institutional Controls):	1 year

Under this alternative, the existing forest cover, existing slope stabilization wall, existing fencing and new institutional controls (a deed restriction) would prevent future residential or industrial use of the Site and would ensure that current protections against exposures to remaining low-threat buried landfill materials are maintained. The establishment of a deed restriction ensures that future Site uses do not result in the disturbance of the surface of the Site, thereby preventing future residential or commercial/industrial development of the landfill area. This would be combined with continued maintenance of security measures at the Site, including fencing and signage, to prevent trespassers from disturbing the existing surface of the Site, and semi-annual monitoring to ensure that the surface conditions at the Site and the slope stabilization wall continue to prevent direct contact with underlying wastes and protect against erosion. This alternative also includes the sealing of remaining shallow monitoring wells at the Site. Because this alternative would result in contaminants remaining on-site above levels that would allow for unlimited use and unrestricted exposure, five-year reviews would be conducted.

Because the property was legally abandoned during prior bankruptcy proceedings, there is no clear current owner of the Site. Given this, IP and GPCP are working toward securing a deed restriction at the Site through legal proceedings.

EVALUATION OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria; namely, overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements; long-term effectiveness and permanence; reduction of toxicity, mobility or volume; short-term effectiveness; implementability; cost; and state and community acceptance. The evaluation criteria are described below.

- Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
- Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provide grounds for invoking a waiver.
- Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It

also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

- Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.
- Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.
- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
- Cost includes estimated capital and O&M costs, and net present worth costs.
- State acceptance indicates whether, based on its review of the 2010 FS report and Proposed Plan, the State concurs with, opposes, or has no comment on the selected remedy at the present time.
- Community acceptance will be assessed and refers to the public's general response to the alternatives described in the Proposed Plan and the 2010 FS report.

A comparative analysis of these alternatives based upon the evaluation criteria noted above follows.

Overall Protection of Human Health and the Environment

The Forested Cover and Stabilization Wall with Institutional Controls Alternative provides a greater degree of overall protection of human health and the environment than the No Further Action Alternative through its long-term monitoring/maintenance and deed restriction features. Both alternatives are comparable in terms of compliance with ARARs and neither alternative presents increased short-term risks.

Compliance with ARARs

Both alternatives are comparable in terms of compliance with ARARs. Chemical-specific and location-specific ARARs are not identified for either alternative. In addition, the Forested Cover and Stabilization Wall with Institutional Controls Alternative will comply with the substantive requirements of the New Jersey Technical Requirements for Site Remediation, an action-specific ARAR, relative to the establishment of a deed notice and with New Jersey regulations regarding the sealing of monitoring wells.

Long-Term Effectiveness and Permanence

The Forested Cover and Stabilization Wall with Institutional Controls Alternative provides greater long-term effectiveness by utilizing a deed restriction and monitoring/maintenance of control features to ensure that long-term protection against potential exposures to low-level-threat buried landfill materials is maintained. The No Further Action Alternative is protective under current Site conditions but continued protection in the future is not assured. Both alternatives require the performance of five-year reviews, while the Forested Cover and Stabilization Wall with Institutional Controls Alternative also requires continued monitoring and maintenance of control features at the Site.

Reduction of Toxicity, Mobility, or Volume through Treatment

Both alternatives offer comparable reductions of toxicity, mobility or volume of contamination through treatment. Under each alternative, the toxicity of principal threats was previously addressed through the removal of drums and the off-site treatment (incineration) of principal-threat wastes. Treatment of the remaining low-threat landfilled materials is considered technically impracticable.

Short-Term Effectiveness

Both alternatives are comparable in the short term, as neither alternative requires remedial actions that could result in increased short-term risks to on-site workers. Also, under both alternatives, current Site conditions are protective of human health and the environment, so remedial action objectives are achieved in the short-term. The implementation of the deed restriction component of the Forested Cover and Stabilization Wall with Institutional Controls Alternative could take time to implement, due to legal proceedings that are required to establish the legal authority to create a deed restriction for the property.

Implementability

The No Further Action Alternative is easily implemented, as it only requires the performance of five-year reviews. While slightly more complex, the Forested Cover and Stabilization Wall with Institutional Controls Alternative is also relatively easily implemented, requiring the establishment of a deed restriction as well as the performance of five-year reviews and continued monitoring and maintenance, when needed. While the establishment of a legal entity with the authority to assign a deed restriction to the property may pose some legal hurdles, efforts completed to date indicated that it will be implementable in the long run. Neither alternative would adversely impact the undertaking of additional remedial actions, if determined to be necessary in the future.

Cost

The present-worth costs for the alternatives are calculated using a discount rate of 7 percent and a 30-year time interval. The estimated capital, annual O&M, and present-worth costs for each of the alternatives are presented in the following table.

Alternative	Capital Cost	Annual O&M Cost	Total Present Worth Cost
1	$0	$20,000	$52,000
2	$44,000	$55,500	$219,000

As can be seen by the cost estimates, the No Further Action Alternative is the less costly of the two alternatives, with the only cost being that of conducting the five-year reviews. The Forested Cover and Stabilization Wall with Institutional Controls Alternative is more expensive, at a total estimated present worth cost of $219,000. The added cost is associated with long-term maintenance and monitoring, the establishment of a deed restriction, and the sealing of the existing monitoring wells.

State Acceptance

NJDEP concurs with the preferred alternative.

Community Acceptance

Community acceptance of the preferred alternative will be assessed following review of the public comments received on the various reports and the Proposed Plan. A responsiveness summary will be prepared to address significant comments received during the public comment period.

PREFERRED ALTERNATIVE

Based upon an evaluation of the various alternatives, EPA and NJDEP recommend the Forested Cover and Stabilization Wall with Institutional Controls Alternative as the preferred alternative to address the Crown Vantage Landfill Site. Specifically, this would involve the following:

- Implementation of a deed restriction to ensure that future Site uses do not result in the disturbance of the surface of the Site, thereby preventing future residential or commercial/ industrial development of the landfill area.
- Continued maintenance of security measures at the Site (e.g., signage and fencing).
- Continued maintenance of the slope stabilization wall.
- Sealing of remaining shallow monitoring wells.
- Semi-annual monitoring to ensure that Site conditions remain protective of human health and the environment.

Because the property was legally abandoned during prior bankruptcy proceedings, there is no clear current owner of the Site. Given this, IP and GPCP are working toward securing a deed restriction at the Site through legal proceedings.

Because this alternative will result in contaminants remaining on-site above levels that would allow for unlimited use and unrestricted exposure, five-year reviews will be conducted.

The preferred alternative is believed to provide greater protection of human health and the environment and greater long-term effectiveness of the two alternatives. It is considered to be comparable to the No Further Action Alternative in terms of compliance with ARARs, reduction of toxicity, mobility or volume through treatment and short-term effectiveness. While slightly more complicated to implement than the No Further Action Alternative, the preferred alternative is considered to provide the best balance of tradeoffs among alternatives with respect to the evaluation criteria. EPA and NJDEP believe that the preferred alternative will address potential future exposures to remaining landfilled materials while providing the best balance of tradeoffs among the alternatives with respect to the evaluation criteria. The removal of drums during previous investigations and the RI has already met the statutory preference for the use of treatment as a principal element.

KEY DEFINITIONS AND ACRONYMS:

AOC: Administrative Agreement and Order on Consent.

ARARs: Applicable or Relevant and Appropriate Requirements. These are chemical-specific, location-specific or action-specific Federal or State environmental rules and regulations that may pertain to the Site or a particular alternative.

Aroclor: See PCB definition.

Avian: Of or characteristic of birds.

BAF: Bioaccumulation factor. Numeric factor that reflects the uptake and retention of a chemical by an organism from its surrounding environmental media.

BERA: Baseline Ecological Risk Assessment. The SLERA determines the need for a BERA. The BERA uses more realistic and site-specific information about potential exposures and effects in order to evaluate potential ecological risks should remedial activities not be implemented.

BHHRA: Baseline Human Health Risk Assessment. An evaluation of the risk posed to human health should remedial activities not be implemented.

Carcinogenic Risk: Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances. For example, EPA's acceptable risk range for Superfund hazardous waste sites is 10^{-4} to 10^{-6}, meaning there is a one additional chance in 10,000 (1×10^{-4}) to 1 additional chance in 1 million (1×10^{-6}) that a person will develop cancer if exposed to a Site contaminant that is not remediated.

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act. A Federal law, commonly referred to as Superfund, passed in 1980 that provides for response actions at sites found to be contaminated with hazardous substances, pollutants or contaminants that endanger public health and safety or the environment.

COPCs: Chemicals of potential concern.

COPEC: Contaminant of potential ecological concern.

EPA: Environmental Protection Agency. The Federal agency responsible for administration and enforcement of CERCLA (and other environmental statutes and regulations). The EPA has final approval authority for the selected ROD.

ESCs: Ecological Screening Criteria.

FS: Feasibility Study. Analysis of the practicability of various remedial action options for the Site.

GPCP: Georgia-Pacific Consumer Products, LP.

Ground water: Subsurface water that occurs in soils and geologic formations that are fully saturated.

GWQS: Ground water quality standards, as promulgated at NJAC 7:9C.

HI: Hazard Index. For the BHHRA, the HI is a number indicative of noncarcinogenic health effects that is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than one indicates that the human population is not likely to experience adverse effects. For the BERA, the HI is a summation of HQs for individual contaminants.

HMW: High molecular weight.

HQ: Hazard Quotient. HQs are used to evaluate noncarcinogenic health effects and ecological risks. A value equal to or less than one indicates that the human or ecological populations are not likely to experience adverse effects.

Insectivorous: Feeds on insects.

Invertebrate: Lacking a backbone or spinal column.

IP: International Paper Company.

LOAEL: Lowest observable adverse effect level. The lowest concentration or amount of a substance found by experiment or observation that causes an adverse impact on a target organism under defined conditions of exposure.

Mammalian: Of or characteristic of mammals.

MCLs: Maximum Contaminant Levels. Maximum contaminant levels for drinking water, as promulgated at 40 CFR 141 or NJAC 7:10.

NCP: National Contingency Plan. The promulgated regulations (40 CFR 300.430) that establish the basis for federal actions under CERCLA.

NJDEP: New Jersey Department of Environmental Protection.

NOAEL: No observable adverse effect level. The level of exposure to a substance, found by experiment or observation, at which there is no biologically or statistically significant increase in the frequency or severity of adverse effects in the exposed population.

Noncarcinogenic Risk: Non-cancer hazards (or risk) are expressed as a hazard index that compares the existing level of exposure to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sensitive population to experience adverse health effects. EPA's threshold level for noncarcinogenic risk at Superfund sites is 1, meaning that if the exposure exceeds the threshold; there may be a concern for potential non-cancer effects.

NRDCSRS: Non-Residential Direct Contact Soil Remediation Standards, as defined at NJAC 7:26D, Appendix A, Table 1B.

O&M: Operation and maintenance.

Omnivorous: Eats both plants and animals.

PAHs: Polynuclear Aromatic Hydrocarbons (also known as polycyclic aromatic hydrocarbons): Chemical compounds that occur in oil, coal, and tar deposits, and are produced as byproducts of fuel burning.

PCBs: Polychlorinated biphenyls. A group of chemicals used in transformers and capacitors as an insulating material, in gas pipeline systems as a lubricant, and for other purposes. Due to their toxicity and environmental persistence, sale and new use of these materials was banned in 1979. Mixtures of PCBs are often referred to as Aroclors.

Pore Water: Ground water located beneath the ground surface in soil and sediment pore spaces.

PRG: Preliminary remediation goal.

Present-Worth Cost: Total cost, in current dollars, of the remedial action. The present-worth cost includes capital costs required to implement the remedial action, as well

as the cost of long-term operations, maintenance, and monitoring.

Principal Threat: See text box on page 7.

Proposed Plan: A document that presents the preferred remedial alternative and requests public input regarding the proposed cleanup alternative.

PSI: Preliminary Site Investigation

Public Comment Period: The time allowed for the members of a potentially affected community to express views and concerns regarding EPA's preferred remedial alternative.

Remedial Action Objectives: Objectives of remedial actions that are developed based on contaminated media, contaminants of concern, potential receptors and exposure scenarios, human health and ecological risk assessment, and attainment of regulatory cleanup levels.

Remedial Action: An action taken to address hazardous substances at a site.

RI: Remedial Investigation. A study of a facility where hazardous substances have been disposed or released that supports the selection of a remedy. The RI identifies the nature and extent of contamination at the facility and analyzes risk associated with COPCs.

RME: Reasonable Maximum Exposure. Highest level of human exposure that could reasonably be expected to occur.

ROD: Record of Decision. A legal document that describes the remedy selected for a site, the basis for choosing that remedy, and public comments on the selected remedy.

RSLs: Regional Screening Levels. Chemical-specific concentrations developed by EPA for individual contaminants in air, drinking water and soil that may warrant further investigation or site cleanup.

SLERA: Screening Level Ecological Risk Assessment. An initial, conservative evaluation of the potential risk posed to the environment if remedial activities are not performed at the Site. The SLERA provides a conservative estimate of potential ecological risks and compensates for uncertainty by incorporating numerous conservative assumptions. If a SLERA indicates the potential for ecologically significant risks to be present, a site-specific BERA is warranted.

Superfund: See CERCLA.

SVOCs: Semi-volatile organic compounds. A class of organic compounds that is made up of acid extractable and base neutral organic compounds. Examples of SVOCs include PAHs, phenols and phthalates.

SWQS: Surface water quality standards, as promulgated at NJAC 7:9B.

TRV: Toxicity Reference Value. Dose above which ecologically relevant effects may occur. See NOAEL and LOAEL.

UCL: Upper Confidence Limit. In performing risk assessments, EPA recommends using the average concentration to represent the concentration of a contaminant likely to be contacted over time. Because of uncertainties associated with estimating the true average concentration of a contaminant at a site, the EPA prescribes the use of a statistically-based value, the 95%, 97.5% or 99% UCL of the arithmetic mean, to represent the average concentration.

VOCs: Volatile Organic Compounds. Type of chemical that readily vaporizes, often producing a distinguishable odor.

WQC: Water Quality Criteria. The Delaware River Basin Commission has established water quality criteria (also referred to as water quality objectives) for non-tidal zones of the Delaware River.